

**THAT WHICH IS CLAIMED IS:**

1. A method of effecting microbiocidal activity in water, which method comprises providing in the water using at least one 1,3-dibromo-5,5-dialkylhydantoin microbiocidal agent in which one of the alkyl groups in the 5-position is a methyl group and in which the other alkyl group in the 5-position has in the range of 1 to 4 carbon atoms, a microbiocidally effective amount of "free chlorine" that is greater than could be predicted from the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin, while using a smaller molar quantity of said at least one 1,3-dibromo-5,5-dialkylhydantoin than the molar quantity of N,N'-bromochloro-5,5-dimethylhydantoin that would be required to release in said water the same microbiocidally effective amount of "free chlorine".

2. A method of Claim 1 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-isobutyl-5-methylhydantoin.

3. A method of Claim 1 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-n-propyl-5-methylhydantoin.

4. A method of Claim 1 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-ethyl-5-methylhydantoin.

5. A method of Claim 1 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is a mixture of two or more of said 1,3-dibromo-5,5-dialkylhydantoins.

6. A method of Claim 1 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is a mixture of 1,3-dibromo-5,5-dimethylhydantoin and 1,3-dibromo-5-ethyl-5-methylhydantoin.

7. A method of Claim 1 wherein said water has a pH of at least about 8.0.

8. A method of effecting microbiocidal activity in water having a pH of at least about 8.0, which method comprises providing in such water using a 1,3-dibromo-5,5-dimethylhydantoin microbiocidal agent, a microbiocidally effective amount of "free chlorine"

that is greater than could be predicted from the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin, while using a smaller quantity by weight of 1,3-dibromo-5,5-dimethylhydantoin than the quantity by weight of N,N'-bromochloro-5,5-dimethylhydantoin that would be required to release in said water the same microbiocidally effective amount of "free chlorine".

9. A method of Claim 8 wherein the 1,3-dibromo-5,5-dimethylhydantoin being used has an average particle size of at least about 175 microns.

10. A method of Claim 8 wherein the 1,3-dibromo-5,5-dimethylhydantoin being used has an average particle size of at least about 200 microns.

11. A method of Claim 8 wherein the 1,3-dibromo-5,5-dimethylhydantoin being used has an average particle size of at least about 300 microns.

12. A method of Claim 8 wherein the 1,3-dibromo-5,5-dimethylhydantoin being used is in the form of a shape-retentive pressure compacted article produced by pressure compacting 1,3-dibromo-5,5-dimethylhydantoin particulate solids with use of a binder.

13. A method of Claim 12 wherein the 1,3-dibromo-5,5-dimethylhydantoin particulate solids used in forming said article had, prior to compaction, an average particle size of at least about 175 microns.

14. A method of Claim 8 wherein the 1,3-dibromo-5,5-dimethylhydantoin being used is in the form of a compacted product produced using as a binder an amount of a micronized synthetic polyolefin-based hydrocarbon wax and/or a micronized synthetic polyfluorocarbon wax effective to form said compacted product, said wax being compatible with said 1,3-dibromo-5,5-dimethylhydantoin.

15. A method of Claim 8 wherein the 1,3-dibromo-5,5-dimethylhydantoin being used is in the form of a compacted product formed from 1,3-dibromo-5,5-dimethylhydantoin having an average particle size of at least 175 microns, and wherein said compacted product was produced using as a binder an amount of a saturated, normally solid, fatty amide effective to form said compacted product.

16. A method of Claim 15 wherein the 1,3-dibromo-5,5-dimethylhydantoin used in forming said compacted product had an average particle size of at least about 200 microns.

17. A method of Claim 15 wherein the 1,3-dibromo-5,5-dimethylhydantoin used in forming said compacted product had an average particle size of at least about 300 microns.

18. A composition having microbiocidal activity, which composition comprises water to which has been added a microbiocidally effective quantity of at least one 1,3-dibromo-5,5-dialkylhydantoin in which one of the alkyl groups in the 5-position is a methyl group and in which the other alkyl group in the 5-position has in the range of 1 to 4 carbon atoms, (i) the molar quantity of said at least one 1,3-dibromo-5,5-dialkylhydantoin added being less than the molar quantity of N,N'-bromochloro-5,5-dimethylhydantoin required to effect the same degree of microbiocidal activity in said water, (ii) the quantity of said at least one 1,3-dibromo-5,5-dialkylhydantoin added releasing an amount of "free chlorine" that is greater than the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin, and (iii) the amount of "free chlorine" released by the quantity of said at least one 1,3-dibromo-5,5-dialkylhydantoin added being greater than the amount of "free chlorine" that could be predicted to be released by that quantity of said at least one 1,3-dibromo-5,5-dialkylhydantoin on the basis of the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin.

19. A composition of Claim 18 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-isobutyl-5-methylhydantoin.

20. A composition of Claim 18 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-n-propyl-5-methylhydantoin.

21. A composition of Claim 18 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-ethyl-5-methylhydantoin.

22. A composition of Claim 18 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is a mixture of two or more of said 1,3-dibromo-5,5-dialkylhydantoins.

23. A composition of Claim 18 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is a mixture of 1,3-dibromo-5,5-dimethylhydantoin and 1,3-dibromo-5-ethyl-5-methylhydantoin.

24. A composition of Claim 18 wherein said water has a pH of at least about 8.0.

25. A composition having microbiocidal activity, which composition comprises water containing a microbiocidally effective amount of "free chlorine" provided in the water by at least one 1,3-dibromo-5,5-dialkylhydantoin in which one of the alkyl groups in the 5-position is a methyl group and in which the other alkyl group in the 5-position has in the range of 1 to 4 carbon atoms, (i) the molar quantity of said at least one 1,3-dibromo-5,5-dialkylhydantoin providing said amount of "free chlorine" in the water being less than the molar quantity of N,N'-bromochloro-5,5-dimethylhydantoin required to effect the same degree of microbiocidal activity in said water, (ii) the quantity of said at least one 1,3-dibromo-5,5-dialkylhydantoin providing said amount of "free chlorine" releasing an amount of "free chlorine" that is greater than the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin, and (iii) the amount of "free chlorine" released by the quantity of said at least one 1,3-dibromo-5,5-dialkylhydantoin providing said amount of "free chlorine" being greater than the amount of "free chlorine" that could be predicted to be released by that quantity of said at least one 1,3-dibromo-5,5-dialkylhydantoin on the basis of the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin.

26. A composition of Claim 25 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-isobutyl-5-methylhydantoin.

27. A composition of Claim 25 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-n-propyl-5-methylhydantoin.

28. A composition of Claim 25 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-ethyl-5-methylhydantoin.

29. A composition of Claim 25 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is a mixture of two or more of said 1,3-dibromo-5,5-dialkylhydantoins.

30. A composition of Claim 25 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is a mixture of 1,3-dibromo-5,5-dimethylhydantoin and 1,3-dibromo-5-ethyl-5-methylhydantoin.

31. A composition of Claim 25 wherein said water has a pH of at least about 8.0.

32. A composition having microbiocidal activity, which composition comprises water to which has been added a microbiocidally effective quantity of 1,3-dibromo-5,5-dimethylhydantoin, (i) the quantity by weight of 1,3-dibromo-5,5-dimethylhydantoin added being less than the quantity by weight of N,N'-bromochloro-5,5-dimethylhydantoin required to effect the same degree of microbiocidal activity in said water, (ii) the quantity of 1,3-dibromo-5,5-dimethylhydantoin added releasing an amount of "free chlorine" that is greater than the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin, and (iii) the amount of "free chlorine" released by the quantity of the 1,3-dibromo-5,5-dimethylhydantoin added being greater than the amount of "free chlorine" that could be predicted to be released by that quantity of the 1,3-dibromo-5,5-dimethylhydantoin on the basis of the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin.

33. A composition of Claim 32 wherein said water has a pH of at least about 8.0.

34. A composition having microbiocidal activity, which composition comprises water containing a microbiocidally effective amount of "free chlorine" provided in the water by 1,3-dibromo-5,5-dimethylhydantoin, (i) the quantity by weight of 1,3-dibromo-5,5-dimethylhydantoin providing said amount of "free chlorine" in the water being less than the quantity by weight of N,N'-bromochloro-5,5-dimethylhydantoin required to effect the same degree of microbiocidal activity in said water, (ii) the quantity of 1,3-dibromo-5,5-dimethylhydantoin providing said amount of "free chlorine" releasing an amount of "free chlorine" that is greater than the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin, and (iii) the amount of "free chlorine" released by the quantity of 1,3-dibromo-5,5-dimethylhydantoin providing said amount of "free chlorine" being greater than the amount of "free chlorine" that could be predicted to be released by that quantity of 1,3-dibromo-5,5-dimethylhydantoin on

the basis of the amount of "free chlorine" that would be released in said water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin.

35. A composition of Claim 34 wherein said water has a pH of at least about 8.0.

36. As a composition of matter, water in which microbiological and/or biofilm activity is minimized if not eliminated by the addition thereto of an amount of "free chlorine" produced in the water by at least one 1,3-dibromo-5,5-dialkylhydantoin biocidal agent in which one of the alkyl groups in the 5-position is a methyl group and in which the other alkyl group in the 5-position has in the range of 1 to 4 carbon atoms (DBDAH), wherein the amount of "free chlorine" actually present in the water is greater than could be predicted from the amount of "free chlorine" that would be provided in such water by an equimolar quantity of N,N'-bromochloro-5,5-dimethylhydantoin (BCDMH), as determinable by comparative testing as follows:

- a) determining the amount of species of said at least one 1,3-dibromo-5,5-dialkylhydantoin and of BCDMH which register respectively as "total chlorine" using Hach Method 8167 (copyright 1997, by Hach Company); and
- b) determining the amount of species of the DBDAH and of BCDMH which register respectively as "free chlorine" using Hach Method 8021 (copyright 1997, by Hach Company); and
- c) determining respectively for the DBDAH and BCDMH the relative extent of hydrolysis to species which register as "free chlorine".

37. A composition of Claim 36 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-isobutyl-5-methylhydantoin.

38. A composition of Claim 36 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-n-propyl-5-methylhydantoin.

39. A composition of Claim 36 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5-ethyl-5-methylhydantoin.

40. A composition of Claim 36 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is a mixture of two or more of said 1,3-dibromo-5,5-dialkylhydantoins.

41. A composition of Claim 36 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is a mixture of 1,3-dibromo-5,5-dimethylhydantoin and 1,3-dibromo-5-ethyl-5-methylhydantoin.

42. A composition of Claim 36 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5,5-dimethylhydantoin.

43. A composition of Claim 36 wherein said water has a pH of at least about 8.0.

44. A composition of Claim 36 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is selected from 1,3-dibromo-5-isobutyl-5-methylhydantoin, 1,3-dibromo-5-n-propyl-5-methylhydantoin, 1,3-dibromo-5-ethyl-5-methylhydantoin, 1,3-dibromo-5,5-dimethylhydantoin, or a mixture of at least any two of them.

45. A composition of Claim 43 wherein said at least one 1,3-dibromo-5,5-dialkylhydantoin is 1,3-dibromo-5,5-dimethylhydantoin.